

- (i) Consider the RSA scheme with public key  $(23, 407)$ . Encrypt the message  $M = 321$  and determine the corresponding private key.
- (ii) Is 98654320480 divisible by 120?
- (iii) Shade the region  $|\bar{z} - 2| \leq 3$ .
- (iv) Prove that  $\gcd(a, b) \leq |a - b|$  provided  $a \neq b$ .
- (v) What is the remainder when we divide  $7^{8^9}$  by 10?
- (vi) What is  $\gcd((5!)^4, (4!)^5)$ ?
- (vii) Solve the simultaneous congruence
- $$\begin{aligned} 23x &\equiv 17 \pmod{25} \\ 13x &\equiv 7 \pmod{14}. \end{aligned}$$
- (viii) Find all solutions to  $z + \bar{z} = 2i$ . Find all solutions to  $|z| = 2i$ .
- (ix) Prove or disprove: If  $c \mid ab$  then  $c \mid a$  or  $c \mid b$ .
- (x) Solve  $z^2 + 2\bar{z} - 1 = 0$  over  $\mathbb{C}$ .

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